

WHAT IS CLAIMED IS:

1. Perpendicular magnetic recording media,  
comprising:

a non-magnetic substrate;

5 a first recording layer which is provided on  
the non-magnetic substrate, which has perpendicular  
magnetic anisotropy and the magnitude of magnetic  
exchange interaction between grains of which is  
substantially zero; and

10 a second recording layer which is laminated on  
the first recording layer, which has perpendicular  
magnetic anisotropy and the magnetic exchange  
interaction between grains of which is larger than that  
of the first recording layer.

15 2. Perpendicular magnetic recording media  
according to Claim 1, wherein:

the exchange stiffness constant between grains  
of the first recording layer is  $0.05 \times 10^{-11}$  J/m or  
less; and

20 the exchange stiffness constant between grains  
of the second recording layer is in a range of  $0.15 \times$   
 $10^{-11}$  J/m to  $0.8 \times 10^{-11}$  J/m.

3. Perpendicular magnetic recording media  
according to Claim 1, wherein:

25 the magnetic anisotropy constant of the second  
recording layer is in a range of  $2.5 \times 10^5$  J/m<sup>3</sup> to  $4.5$   
 $\times 10^5$  J/m<sup>3</sup>.

4. Perpendicular magnetic recording media

according to Claim 2, wherein:

the magnetic anisotropy constant of the second recording layer is in a range of  $2.5 \times 10^5 \text{ J/m}^3$  to  $4.5 \times 10^5 \text{ J/m}^3$ .

5            5.            Perpendicular magnetic recording media according to Claim 1, wherein:

the second recording layer has polycrystalline structure.

10           6.            Perpendicular magnetic recording media according to Claim 2, wherein:

the second recording layer has polycrystalline structure.

15           7.            Perpendicular magnetic recording media according to Claim 3, wherein:

the second recording layer has polycrystalline structure.

8.            Perpendicular magnetic recording media, comprising:

a non-magnetic substrate;

20           a first recording layer provided on the non-magnetic substrate and provided with perpendicular magnetic anisotropy; and

a second recording layer laminated on the first recording layer and provided with perpendicular magnetic anisotropy, wherein:

25           the exchange stiffness constant showing the magnitude of magnetic exchange interaction between grains of the first recording layer is  $0.05 \times 10^{-11} \text{ J/m}$

or less and  $0.0001 \times 10^{-11}$  J/m or more.

9. Perpendicular magnetic recording media according to Claim 8, wherein:

the exchange stiffness constant between grains  
5 of the second recording layer is in a range of  $0.15 \times 10^{-11}$  J/m to  $0.8 \times 10^{-11}$  J/m.

10. Perpendicular magnetic recording media, comprising:

a non-magnetic substrate;

10 a first recording layer which is provided on the non-magnetic substrate, which is a magnetic film mainly made of Co and Cr, which has perpendicular magnetic anisotropy and the magnitude of magnetic exchange interaction between grains of which is  
15 substantially zero; and

a second recording layer laminated on the first recording layer and having perpendicular magnetic anisotropy, wherein:

in the first recording layer, Cr is segregated  
20 at the grain boundaries between ferromagnetic grains forming the film; and

its density is in a range of 21 atomic percents to 29 atomic percents.

11. Perpendicular magnetic recording media according to Claim 10, wherein:

25 the second recording layer is a magnetic film mainly made of Co and Cr; and

the exchange stiffness constant between its

grains is in a range of  $0.15 \times 10^{-11}$  J/m to  $0.8 \times 10^{-11}$  J/m.

12. Perpendicular magnetic recording media according to Claim 10, wherein:

5 in the second recording layer, Cr is segregated at the grain boundaries between ferromagnetic grains forming the film; and

its density is in a range of 16 atomic percents to 19 atomic percents.

10 13. Perpendicular magnetic recording media according to Claim 11, wherein:

in the second recording layer, Cr is segregated at the grain boundaries between ferromagnetic grains forming the film; and

15 the density is in a range of 16 atomic percents to 19 atomic percents.

14. A magnetic recording apparatus, comprising:

20 the perpendicular magnetic recording media according to Claim 1;

a driving system for rotating the perpendicular magnetic recording media;

a magnetic head for read/write;

25 means for relatively moving the magnetic head on the perpendicular magnetic recording media; and

means for reproducing an output signal from the magnetic head.